WHAT IS CLAIMED IS:

1. A dynamic bandwidth updating method for a communications system in which a plurality of subscriber apparatuses and a station apparatus are connected to the same transmission channel for bidirectional communication, for dynamically updating a bandwidth allocated in a direction of upstream transmission from the subscriber apparatuses to the station apparatus, comprising the steps of:

calculating a bandwidth usage rate from a bandwidth allocated in a bandwidth updating period and a bandwidth actually used in the bandwidth updating period; and

determining a bandwidth to be allocated in a subsequent bandwidth updating period based on the bandwidth usage rate.

2. A bandwidth updating method for a communications system in which a plurality of subscriber apparatuses, each connected to respective subscriber terminal apparatuses, and a station apparatus are connected to the same transmission channel for bidirectional communication, for dynamically updating a bandwidth allocated in a direction of upstream transmission from the subscriber terminal apparatuses to the station apparatus via the subscriber apparatuses, comprising the steps of:

calculating a bandwidth usage rate from a bandwidth allocated in a bandwidth updating period and a bandwidth actually used in the bandwidth updating period; and

determining a bandwidth to be allocated in a subsequent bandwidth updating period based on the bandwidth usage rate.

3. The bandwidth updating method according to claim 1, wherein the allocation of bandwidth involves ensuring that a minimum guaranteed bandwidth guaranteeing a minimum level of communication is allocated to the subscriber apparatus, and determining a surplus bandwidth which is a result of subtraction of the minimum guaranteed bandwidth from an allocated bandwidth.

4. The bandwidth updating method according to claim 2, wherein the allocation of bandwidth involves ensuring that a minimum guaranteed bandwidth guaranteeing a minimum level of communication is allocated to the subscriber terminal apparatus, and determining a surplus bandwidth which is a result of subtraction of the minimum guaranteed bandwidth from an allocated bandwidth.

5. The bandwidth updating method according to claim 3, further comprising the steps of:

10073256 012402

calculating in the subscriber apparatus a requested surplus bandwidth requested of the station apparatus; and

determining in the station apparatus the surplus bandwidth based on the requested surplus bandwidth, so as to determine the bandwidth to be allocated.

6. The bandwidth updating method according to claim 4, further comprising the steps of:

calculating in the subscriber terminal apparatus a requested surplus bandwidth requested of the station apparatus; and

determining in the station apparatus the surplus bandwidth based on the requested surplus bandwidth, so as to determine the bandwidth to be allocated.

7. The bandwidth updating method according to claim 3, wherein the surplus bandwidth is calculated using a first upper threshold value for determination that there is a bandwidth shortage when an allocated bandwidth is equal to the minimum guaranteed bandwidth, a second upper threshold value for determination that there is a bandwidth shortage when the allocated bandwidth is larger than the minimum guaranteed bandwidth and a lower threshold value for determination that there is an excessive bandwidth when the allocated

bandwidth is larger than the minimum guaranteed bandwidth.

8. The bandwidth updating method according to claim 4, wherein the surplus bandwidth is calculated using a first upper threshold value for determination that there is a bandwidth shortage when an allocated bandwidth is equal to the minimum guaranteed bandwidth, a second upper threshold value for determination that there is a bandwidth shortage when the allocated bandwidth is larger than the minimum guaranteed bandwidth and a lower threshold value for determination that there is an excessive bandwidth when the allocated bandwidth is larger than the minimum guaranteed bandwidth.

9. The bandwidth updating method according to claim 7, wherein, when it is determined, in a case in which the allocated bandwidth is equal to the minimum guaranteed bandwidth, that the bandwidth usage rate exceeds the first upper threshold value or when it is determined, in a case in which the allocated bandwidth is larger than the minimum guaranteed bandwidth, that the bandwidth usage rate exceeds the second threshold value, the surplus bandwidth is calculated such that a maximum bandwidth set up for the subscriber apparatus is allocated to the subscriber apparatus in the subsequent bandwidth

20470.02 0402

updating period.

10. The bandwidth updating method according to claim 8, wherein, when it is determined, in a case in which the allocated bandwidth is equal to the minimum guaranteed bandwidth, that the bandwidth usage rate exceeds the first upper threshold value or when it is determined, in a case in which the allocated bandwidth is larger than the minimum guarantted bandwidth, that the bandwidth usage rate exceeds the second threshold value, the surplus bandwidth is calculated such that a maximum bandwidth set up for the subscriber terminal apparatus is allocated to the subscriber terminal apparatus in the subsequent bandwidth updating period.

11. The bandwidth updating method according to claim 7, wherein, when it is determined, in a case in which the allocated bandwidth is larger than the minimum guaranteed bandwidth, that the bandwidth usage rate exceeds the lower threshold value but does not exceed the second upper threshold value, the surplus bandwidth is calculated such that a bandwidth currently allocated to the subscriber apparatus continues to be allocated to the subscriber apparatus in the subsequent bandwidth updating period.

12. The bandwidth updating method

according to claim 8, wherein, when it is determined, in a case in which the allocated bandwidth is larger than the minimum guaranteed bandwidth, that the bandwidth usage rate exceeds the lower threshold value but does not exceed the second upper threshold value, the surplus bandwidth is calculated such that a bandwidth currently allocated to the subscriber terminal apparatus continues to be allocated to the subscriber terminal apparatus in the subsequent bandwidth updating period.

13. The bandwidth updating method according to claim 7, wherein, when it is determined, in a case in which the allocated bandwidth is larger than the minimum guaranteed bandwidth, that the bandwidth usage rate does not exceed the lower threshold value, the surplus bandwidth is calculated such that the bandwidth, actually used in the bandwidth updating period for determination of the surplus bandwidth, is at a level in the middle of the second upper threshold value and the lower threshold value for the bandwidth allocated in the subsequent bandwidth updating period.

14. The bandwidth updating method according to claim 8, wherein, when it is determined, in a case in which the allocated bandwidth is larger than the minimum guaranteed

2004-229-2004

bandwidth, that the bandwidth usage rate does not exceed the lower threshold value, the surplus bandwidth is calculated such that the bandwidth, actually used in the bandwidth updating period for determination of the surplus bandwidth, is at a level in the middle of the second upper threshold value and the lower threshold value for the bandwidth allocated in the subsequent bandwidth updating period.

15. The bandwidth updating method according to claim 5, wherein the surplus bandwidth is calculated by weighting a dynamically allocatable bandwidth, a difference between a maximum bandwidth and the minimum guaranteed bandwidth, by the requested surplus bandwidth and a parameter that serves as a reference for a charge incurred.

16. The bandwidth updating method according to claim 6, wherein the surplus bandwidth is calculated by weighting a dynamically allocatable bandwidth, a difference between a maximum bandwidth and the minimum guaranteed bandwidth, by the requested surplus bandwidth and a parameter that serves as a reference for a charge incurred.

17. The bandwidth updating method according to claim 1, wherein a bandwidth allocated

to the subscriber apparatus does not exceed a maximum bandwidth set up for the subscriber apparatus.

18. The bandwidth updating method according to claim 2, wherein a bandwidth allocated to the subscriber terminal apparatus does not exceed a maximum bandwidth set up for the subscriber terminal apparatus.

19. A dynamic bandwidth updating apparatus for a communications system in which a plurality of subscriber apparatuses and a station apparatus are connected to the same transmission channel for bidirectional communication, for dynamically updating a bandwidth allocated in a direction of upstream transmission from the subscriber apparatuses to the station apparatus, wherein

a bandwidth usage rate is calculated from a bandwidth allocated in a bandwidth updating period and a bandwidth actually used in the bandwidth updating period, and

a bandwidth to be allocated in a subsequent bandwidth updating period is determined based on the bandwidth usage rate.

20. A bandwidth updating apparatus for a communications system in which a plurality of subscriber apparatuses, each connected to

respective subscriber terminal apparatuses, and a station apparatus are connected to the same transmission channel for bidirectional communication, for dynamically updating a bandwidth allocated in a direction of upstream transmission from the subscriber terminal apparatuses to the station apparatus via the subscriber apparatuses, wherein

a bandwidth usage rate is calculated from a bandwidth allocated in a bandwidth updating period and a bandwidth actually used in the bandwidth updating period, and

a bandwidth is determined to be allocated in a subsequent bandwidth updating period based on the bandwidth usage rate.

20042523.021402